

HABITAT CONNECTIVITY AND RURAL CONTEXT

SENSITIVE DESIGN:

A SYNTHESIS OF PRACTICE

MPART Research Proposal

Submitted by:

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Submitted to:

Montana Department of Transportation

Research Programs

2701 Prospect Avenue

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October 2005

Revised March, 24 2006

1 Problem Statement

There are a group of inter-related issues that are driving the need for increased knowledge about context sensitive solutions and context sensitive design (CSS/CSD) for rural transportation infrastructure including: 1) planning and management of land use (especially determining how transportation relates to other planning and management efforts), 2) preserving the rural nature through roadside design, and 3) preserving wildlife habitat connectivity and minimizing wildlife/vehicle collisions.

Rural areas in the American West are in the midst of a period of population growth unlike any in the past. According to the recent 2000 census, the West was the fastest growing region of the U.S. over the past decade and grew at an average of 19.7%. (U.S. Census, 2000). During that period the population of the region grew by over 10 million, and 67% of the counties in the Rocky Mountain¹ axis grew at rates faster than the national average (Beyers & Nelson, 2000). Most of the growth continues to be in close proximity to the major urban areas of the West (e.g., Denver and Salt Lake City), but high growth areas are also located in regional micropolitan locations including Driggs/Victor and Coeur D' Alene, ID; Bozeman and Whitefish, MT; Durango and Telluride, CO; and Jackson, WY (Vias, Mulligan & Molin, 2002).

There seems to be unlimited demand for primary and secondary homes in high quality amenity communities throughout the Rocky Mountains. In some areas recent population growth rates promise to overwhelm the capacity of local governments to manage the effects of rural growth. There are also high degrees of variability regarding local land use planning controls in many western counties. While most western states defer to local officials for land-use decisions, these efforts are often variable and inconsistent even within regions of single states. This variability presents challenges to transportation officials that are charged with consistently developing and managing corridors that cross many local jurisdictions. Rural residential development affects wildlife, public land access, open spaces, and ultimately, the fiscal structure of the region. As amenity communities evolve to accommodate increasing numbers of residents and visitors, the issues of traffic congestion, overburdened local taxpayers and erosion of scenic vistas from over-development sometimes occur. These challenges can be partially alleviated through constructive community dialogue about how and where people will travel across the landscape and the extent to which publicly funded transportation infrastructure will add to or detract from community quality of life

Many of the smaller towns are heavily dependent on the scenic and ecological integrity of the surrounding countryside for their continued economic health, including living in close proximity to nature and outdoor recreation (Johnson & Rasker, 1995). Improvements to the transportation infrastructure require planning that anticipates growth and regional movement needs, and reflects

¹ The Rocky Mountain States include Idaho, Montana, Wyoming, Utah, Colorado, New Mexico, and Arizona.

the local values. This in turn will benefit the economies of the local communities, the state, and potentially a multi state region.

Many local agencies in rural areas have little to no resources to deal with the challenges of effective land use planning, and there are significant differences in support for land use controls. These tensions create challenges in bringing transportation improvements forward that meet the needs for through movements, are consistent with community goals, and are cost constrained in light of needs far outstripping resources. Simple approaches and options to enhancing roadside design in rural areas could go a long way in helping transportation agencies coordinate highway improvements with adjacent development, while continuing to make necessary improvements to the transportation infrastructure in the state.

As natural landscape changes, it is becoming even more important to preserve priority habitat linkages. Many species of wildlife travel great distances during seasonal migration. Protecting these habitat corridors can be difficult especially when there are so many jurisdictions and agencies that manage land in these areas. I-90 on Bozeman Pass is a great example how one agency alone cannot preserve this prioritized linkage; however, the Forest Service, Montana Rail Link, Montana Department of Transportation, and two local land trusts have coordinated efforts to do so.

Many transportation agencies are already including context sensitive design in their highway projects and the expectations to include context sensitive design continue to grow.

For the purpose of this research “rural” connotes higher speed travel corridors outside of municipal boundaries. This definition constrains the project to highly rural locations by eliminating small community CSD. This is appropriate because of the depth of experience MDT already has with enhancements, non-motorized features, and CSD within smaller communities.

2 Project Objectives and Benefits

The objective is to identify beneficial practices (including programs, design elements, or operations) used within comparable regions to Montana (intermountain west), targeting at a minimum known strategic issues facing the department. These strategic issues include, but are not limited to: system-level planning requirements for habitat protection, traveler safety, improvements to habitat connectivity, and perpetuation of community character and links to local land-use decisions.

Although many transportation studies have been conducted to determine context sensitive solutions and help mitigate interactions between vehicles and wildlife, little work has been done to synthesize this information in a concise and meaningful way that is applicable to transportation in Montana. *Therefore, the primary objective of this project is to synthesize the abundance of information related to transportation applicable to transportation planners at the Montana Department of Transportation.* This synthesis will not include recommendations or guidelines, but identify case studies and practices of other states related to sustainable transportation in Montana. Specifically this effort will attempt to answer the following questions:

- a) What has been done in other similar rural areas?
- b) What character qualities were being “preserved”?
- c) What was the methodology for using that solution/design technique?
- d) How did they choose areas to implement these ideas?
- e) Was the effort successful? And how was “success” defined?
- f) Were the costs justifiable?
- g) What were the benefits of the project (these may be qualitative)?
- h) What products and outcomes were realized?
- i) What software tools or planning procedures were used?

Information will be sought from existing literature and surveys/interviews with public agencies (state and local). Surveys will primarily focus on State DOT planning offices but will also include county and city agencies where innovative techniques and case studies are employed. Projects within Montana that have used innovative CSD will also be investigated. The Western Transportation Institute has already accumulated and organized an extensive compilation of reports and documents related to wildlife-transportation interactions organized in the ARTEMIS clearinghouse. We will also incorporate information from current national efforts to synthesize these issues on a national level.

The topic areas of context sensitive design, land use planning, and habitat connectivity are not tightly defined and have vast literature and case studies. In order to maximize resources WTI will focus its effort on three major areas:

1. **Land Use Planning:** For this area we will investigate land use planning techniques for rural areas. Where appropriate we will identify and summarize case studies of innovative collaborations and partnerships that facilitate integrated land use planning and management. Also WTI will identify the state of the practice regarding the use of software tools, baseline data, and specific information. WTI will focus its efforts on states within the intermountain west where local governments have “home rule” authority over land-use decisions and will especially focus on access management approaches used to support concurrent development. The MDT’s “System Impact Analysis Process” will be used as the baseline for this portion.
2. **Roadside Design that Preserves Rural Character:** Design elements could include fencing style, vegetation types, sign placement, shape of slopes, lighting, integration with site-specific geology and adjoining land, bicycle and pedestrian facilities, and traffic calming. As much as possible we will include case studies, and specific examples of innovative features. We will report on information from other states relating to what guidelines, programs, design techniques and practices they use, the costs of these design elements, and the outcomes from implementation.
3. **Habitat Connectivity and roadway passage for Wildlife:** This area overlaps with the previous two in many ways. However, we will also report on current methods of prioritizing habitat linkage zones, commonly used and available databases, best management practices, and common reasonable and cost effective design elements for habitat connectivity that were not specifically addressed by the other two topic areas. Special attention will be paid to obtaining information on costs and outcomes of various wildlife passage techniques and aquatic species, including areas where roadways are surrounded by private lands.
4. **What permitting and crediting/debiting schemes have been set up or are in the process of being set up by the various resources agencies? What programmatic agreements are established or being established? How are best management practices facilitating the permitting process? What documentation methods for decision-making are used for baseline design versus context sensitive design? How is this difference documented? What is the difference between baseline design for mobility and safety versus the current context sensitive design? For the purpose of this proposal, baseline design means the absolute minimum design to move traffic efficiently and safely.**

Guidance will be sought from the project’s technical panel to further refine and direct the topic area of this search.

The final synthesis report will contain information on the state of the practice in select states. We anticipate that these results will be used by MDT as a resource when planning and designing highways in rural areas, performing systems planning, or designing new programs. Additionally, this report will identify issues where limited guidance or knowledge exists and where further study and development is needed.

3 Project Methodology

The work plan for this project consists of project management, interviews, literature review, evaluation and synthesis, and reporting. These tasks have been designed to address the stated research objectives and are described more fully below.

Task 0 – Project Management

WTI will meet with the project technical panel to facilitate communication regarding the various aspects of this project. An oral presentation will be given at the end of the project to share the final outcome of the synthesis with the technical panel. Additional presentations and technical panel meetings will be scheduled, as needed depending on the direction of the project. It is envisioned that a kick-off and mid-way meeting will be held to ensure the project direction is in line with the desires of the technical panel. Other communication during the project will be through quarterly progress reports and a final report at the end of the project. A third meeting will be held to discuss and obtain comments on the draft report.

Task 1 – Surveys and Interviews

Through survey tools and phone interviews we will gather information from others who have had experience doing CSS/CSD work. This information could be sought from other DOT's, city and county agencies (i.e. county commissioners), and national experts. Information from these groups should provide information that answers these basic questions:

- What important lessons and practices have we (agencies, practitioners, and researchers) learned regarding context sensitive design techniques in the past 8 to 10 years that are applicable to a rural context?
- What currently used techniques (state-of-the-practice) are recognized and available in the U.S. and abroad, but may not be currently implemented within Montana?
- What new and emerging technologies (state of the art) are on the horizon that could be implemented in the future to enhance and improve MDT's existing transportation planning efforts related to preserving rural character in Montana, and improving wildlife passage?

Additionally, we will gather any information on other State DOT's standards, guidelines, funding techniques, and programs in the area of CSD/CSS. We will use a combination of phone interviews and surveys to collect this information. The MDT technical panel will be given ample opportunity to review the survey and interview questions and lists of individuals we plan to survey, prior to their distribution/use.

Task 2 – Literature Review

WTI will conduct a comprehensive literature review to collect available published data related to rural context sensitive design policies, techniques, and methodologies. This search will include published academic and consultancy research. We will make use of the existing developed clearinghouses and groups such as:

- Transportation Research Board Joint Task Force on Context Sensitive Design and Solutions
- Scenic America's CSS clearinghouse, www.ContextSensitiveSolutions.org
- Federal Highway Administration's clearinghouse, www.fhwa.dot.gov/csd
- Wildlife Crossing Structures Toolkit, www.wildlifecrossings.info
- American Association of State Highway and Transportation Officials (AASHTO) and Western Association of State Highway and Transportation Officials (WASHTO).

Tasks 3 – Reporting

The study will be concluded with the preparation of a final synthesis report. This report will include the design of a scanning tour to investigate effective practices in a select set of states similar to Montana. A draft will be submitted to MDT to allow the technical panel to address any concerns or make suggestions or comments. The research team will address comments and a final report will be submitted by the November 15, 2006 deadline. In addition, progress reports will be submitted on a quarterly basis.

Results of the proposed study will be clearly and thoroughly documented in conformance with MDT's standard research report format. Useful conclusions and recommendations applicable to Montana's transportation system will be formulated and presented in a concise manner that will be helpful in charting a path for future planning and research.

4 Project Staffing and Administration

Patrick McGowen will be the Principal Investigator for this research project. Other WTI and MSU staff with specific expertise in this area will be utilized, specifically, Amanda Hardy, Jerry Johnson and Matt Blank.

Mr. Patrick McGowen – Principal Investigator

Patrick McGowen is a research engineer at WTI. Pat obtained his B.S. and M.S. in Civil Engineering from Montana State University, and has been a licensed professional civil engineer in Montana since April 2000. His research at WTI over the past decade has related to rural intelligent transportation systems; transportation impacts to wildlife, safety, travel and tourism; and land use modeling. Specific efforts that relate to this project include creating the TRB subcommittee on Animal Vehicle Collisions, which he currently co-chairs with Amanda Hardy and Marcel Huijser; coordinating and moderating the “Overview of Wildlife Consideration in Highway Design” for the Context Sensitive Highway Design Workshop in Missoula, MT on September 2001; and assisting with a land use planning effort led by Jerry Johnson titled Rural Residential Development and Transportation Infrastructure in High Growth Rural Communities.

Ms. Amanda Hardy, Research Associate

Amanda Hardy is a research ecologist at the Western Transportation Institute. She has studied issues related to wildlife and transportation interactions since 1998. She obtained her B.Sc. in Biology—Fish and Wildlife Management in 1997 and a M.Sc. in Ecology—Fish and Wildlife Management in 2001 at Montana State University. She joined WTI-MSU in July 2001 and has developed the “Wildlife – Transportation Interactions” program into one of WTI-MSU’s focus research areas. Amanda has 13 years of experience in natural resource management and wildlife biology, with an emphasis on human-wildlife interactions for the past 5 years. While her expertise lies in wildlife biology, she sees her work on transportation and wildlife issues as applied ecology, a holistic science that addresses complex relationships between the environment and societal values including cultural, political, economic factors. Amanda is dedicated to using science to develop, apply, and evaluate cost-effective techniques that balance maintaining healthy ecosystems with safe, efficient, and reliable transportation systems, and to disseminating successful applications to practitioners and the public that the transportation agencies serve. Recent projects related to this proposal include the development of guidelines for North American wildlife crossing systems, the evaluation of wildlife crossing structures on US 93, and the Bozeman Pass Wildlife Linkage Study.

Dr. Jerry Johnson, MSU Department of Political Science

Jerry has been a professor at Montana State University since 1989. His research work has focused on numerous projects involving land use planning, incorporating community values in transportation projects, and preserving the character of the rural west. Some of relevant projects and papers include: Ecological Causes and Consequences of Demographic Change in the New West; the chapter titled Rural Residential Development and Transportation Infrastructure in Tourism Dependent Communities in the book edited by Clark, Gill, and Hartman titled Mountain Resort Planning and Development in an Era of Globalization; the chapter Predicting Land Use Change In and Around A Rural Community in the book edited by Hill and Aspinall titled Spatial Information for Land Use Management; and Land Use and Transportation Infrastructure Models for Application in Rural Settings.

Student Research Assistants

The project will also be supported by an undergraduate research assistant, who will work part-time on this project throughout its duration. The student will mainly be in charge of collecting and summarizing relevant literature, assisting with surveys and helping to synthesize the information into the final report.

Support Staff

Various support staff including the Business Manager and Communications Manager for WTI will help with contracting, accounting, editing and publishing.

5 Project Schedule

The revised project schedule, based in the March 17, 2006 meeting, is depicted in Table 1. The total duration of the project is approximately 12 months, with a start date of November 1, 2005, and a final submittal on November 15, 2006.

Table 1: Project Schedule

	Month (2006)											
Task List	1	2	3	4	5	6	7	8	9	10	11	12
0: Project Management												
Kick-off Meeting (2 nd)			◆									
Tech. Panel: Initial Findings						◆						
Tech. Panel: Present Report										◆		
1: Surveys and Interviews												
Develop Draft Survey												
MDT Review												
Conduct Interviews												
2: Literature Review												
3: Reporting												
Develop Draft Report												
MDT Review												
Revise Final Report												

6 Project Budget

The funding request to the Montana Department of Transportation for this proposed research project is \$19,938.23 (costs itemized in Table 2). This amount constitutes 80% of the total cost of the project. Matching funds in the amount of \$4,984.57 (20% of the total budget) will be provided by the Western Transportation Institute of Montana State University through the MPART agreement. The total estimated cost of the project is \$24,922.80.

In-state travel will cover three trips to MDT for the kickoff meeting, a mid-way meeting and the final presentation. Additional resources (counted as expendable supplies) are needed to cover items such as library copy services and report procurement fees. Table 3 shows the number of person-hours that will be devoted to each task by research team members. The total number of person-hours needed to complete the work described in this proposal is 625. Table 4 shows the dollar amounts associated with each task. Benefits are included in the salary rates.

Table 2: Research Budget

Item	MDT	WTI Match	Total
Salaries w/ Benefits	\$16,121.08	\$3,454.52	\$19,575.60
In-State Travel	\$411.76	\$88.24	\$500.00
Expendable Supplies	\$82.35	\$17.65	\$100.00
Direct Costs	\$16,615.19	\$3,560.41	\$20,175.60
Overhead	\$3,323.04	\$1,424.16	\$4,747.20
Total Project Cost	\$19,938.23	\$4,984.57	\$24,922.80

Table 3: Summary of Person Hours

Tasks	Patrick Mcgowen (PI)	Amanda Hardy	Jerry Johnson	Support	Student	Totals
0. Project Management	50			10		60
1. Survey and Interview	40	25	30	0	80	175
2. Literature Review	40	25	30	0	80	175
3. Reporting	60	25	30	20	80	215
Totals	190	75	90	30	240	625

Table 4: Summary of Salary and Benefits for Project Team

Tasks	Patrick Mcgowen (PI)	Amanda Hardy	Jerry Johnson	Support	Student	Totals
0. Project Mgmt.	\$2,369.00	\$0.00	\$0.00	\$388.10	\$0.00	\$2,757.10
1. Survey & Interview	\$1,895.20	\$842.50	\$1,650.00	\$0.00	\$707.20	\$5,094.90
2. Literature Review	\$1,895.20	\$842.50	\$1,650.00	\$0.00	\$707.20	\$5,094.90
3. Reporting	\$2,842.80	\$842.50	\$1,650.00	\$586.20	\$707.20	\$6,628.70
Totals	\$9,002.20	\$2,527.50	\$4,950.00	\$974.30	\$2,121.60	\$19,575.60

7 References

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